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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/634,543	08/05/2003	Ramgopal Darolia	129954	6051
31838	7590	10/17/2007		
HASSE & NESBITT LLC 8837 CHAPEL SQUARE DRIVE SUITE C CINCINNATI, OH 45249			EXAMINER PADGETT, MARIANNE L	
			ART UNIT 1792	PAPER NUMBER
			MAIL DATE 10/17/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/634,543	DAROLIA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Marianne L. Padgett	1792	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 August 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,4-14 and 16-30 is/are pending in the application.
- 4a) Of the above claim(s) 21-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 4- 14, 16-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

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1. The applicants' amendment of both independent claims 1 & 14, correcting problems in clarity as set forth in section 6 of the action mailed 5/8/2007, has removed the problems with respect to 112 second. The independent claims have also been amended to include dependent claim limitations concerning service life (from claims 3 or 15), as well as to add the new issue of the rotor component being made from "nickel-based alloy", where support was cited in [0004], but this is only a prior art discussion of using nickel-based alloys at the highest operating temperatures, thus does not support the present invention. However, the examiner notes that [0023], which is in the Detailed Description, provides the necessary support, especially given preceding paragraph [0016], having disclosures concerning turbine engine rotor components & service operating temperatures.

Applicants amendments which specify the substrate material to be nickel-based alloy, has removed the rejections based on Murakami (JP 62-174372), as the substrates treated therein are Al- or Ti-based, as taught in the abstract & confirmed by the supplied translation. Similarly, the rejections based on Dodd et al. are removed, as this article is describing ion implantation of bearing steel for turbine engines; and the translation of Hayashi (JP 02-015164) shows that it is directed to Ti-based substrate treatment.

2. Applicant's election with traverse of ethic claims 1-20 (1, 4-14 & 16-20 as amended) in the reply filed on 8/8/2007 is acknowledged. The traversal is on the ground(s) that applicants disagree that other techniques could be used to form the product, and appear to be implying that they do not believe a serious burden exists. This is not found persuasive because while the method claims have been amended to eliminate the possibility of coating Al or Cr on the surface of the rotor components, the product claims are still directed to Al or Cr ions "on the surface of the substrate", hence the still be considered inclusive as written of previously suggested alternatives (section 2 of the action mailed 5/8/2007) that affect surface deposition. Also, as amended the method claims are now of different scope in the product claims, being limited to nickel-based alloys, while the product claims are for rotor component structures of any metal. Furthermore, even if the product claims had been amended similarly,

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like structures could have been produced by alternative deposition procedures, such as vapor or electroless deposition followed by ion beam treatment, where the ion energy is sufficient to effect mixing of deposited Al or Cr, such that it is mixed or implanted to the depth claimed.

The requirement is still deemed proper and is therefore made FINAL.

3. This application contains claims 21-30 drawn to an invention nonelected with traverse in the reply filed on 8/8/2007. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

4. From applicant's arguments, it appears that they believe their claims are limited to rotor components that are disk or seals, however the claims as written & amended have three alternatives for the rotor component, i.e. it may be a compressor, or it may be a turbine desk, or it may be a seal element, thus arguments restricting the component solely to a disk or a seal are not convinced. If applicants intend to limit their claims to these two options, they should more precisely phrased their claim language, so that they do not read on three options. Especially note that the first option of "compressor has been shown to be very broad, as previously discussed with respect to applied references, including Naik, or Bedell, or Manty (section 8, action mailed 5/8/2007), which were cited for showing terminology scope & meaning.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of

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each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 1 & 4-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schaeffer et al. (5,780,110), and optionally further view of Weimer et al. (6,532,657 B1).

Schaeffer et al. (5,780,110) teach a coating system for gas turbine engine metallic components generally, or blades & vanes, specifically, where a superalloy substrate that is preferably Ni-based or Co-based superalloy, which is the component may have a bond coating (NiCrAlY or CoCrAlY), hence reads on a rotor component for a compressor of a nickel based alloy (col. 2, lines 45-60). The bond coating superalloy substrate (both substrate & bond coat may be Ni-based) is treated by pre-oxidation and/or surface doping, so as to promote adhesion between the interface of the bond coating & thermal barrier coat (TBC). The surface doping may be performed via ion implantation of elements that oxidized faster than Al, such as exemplified Cr or Y, in order to form oxides of the same crystal structure as  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>. The

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"preoxidation" step is suggested to be performed in oxygen rich atmospheres at temperatures  $>1000^{\circ}\text{C}$  for times  $>1$  hr after depositing the bond coating, but before deposition of the TBC to heal cracks or pores in the bond coating & thermodynamically stabilize the low atomic volume  $\alpha\text{-Al}_2\text{O}_3$  phase. See the abstract; figures; col. 1, lines 10-63 (background); summary; col. 2, lines 47-col. 3, lines 64 general structure & deposition techniques and col. 4, lines 41-col. 5, lines for, especially col. 4, lines 47-57 & 66-col. 5, line 4; and claims, particularly 1 & 2. It is noted that while Schaeffer et al. teach that either or both preoxidation & surface doping of the bond coat may be performed, they do not necessitate any order of these two procedures.

While Schaeffer does not teach implantation depth *per se*, note that the  $\alpha\text{-Al}_2\text{O}_3$  interface layer, reference #28, as shown in figure 2 is taught to have a thickness of 0.01-0.25 mils (col. 4, lines 35-38) = about 0.25-6.4  $\mu$ , hence as the interface may be formed by surface doping one of ordinary skill in the art would conclude that appropriate implantation depths in the bond coating would have been on the order of the thickness of the formed interface layer thus suggestive of the claimed implantation depths of up to 2  $\mu$  or about 0.1-0.5  $\mu$ , which encompass the interface thickness. Also note that this thickness applies to the oxidation procedure of heating in oxygen rich environment, and overlaps with values claimed by applicants.

Schaeffer does not teach the specific rotor components of compressor, turbine disk or seal element, however note previous discussion concerning compressors, or alternately note turbine components in general are suggested such that it would've been obvious to one of ordinary skill in the art to provide taught protective coating system, which is specifically designed to protect metallic components from high-temperature corrosion & oxidation problems via thin hard adherent layers, thus it would've been obvious to one of ordinary skill in the art to employ such techniques to any susceptible metallic rotor



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components subject to oxidative and corrosive atmospheres, which would have been expected to be inclusive of claimed service operating temperatures and claimed specific rotor components.

While the claims as written do not necessitate that the claimed rotor component necessarily be either a turbine disk or a seal element, as the options alternatively include "a compressor", applicants arguments indicate a probable intent to have limited the claims to the options of turbine disk or seal element, hence in view of these arguments & the amendment of the claims limiting them to nickel-based alloys, Weimer et al. (657) may be optionally combined with Schaeffer et al. (110) to show that these two specific components are also known to need further protection, to be made of Ni-based superalloy & to be treated by analogous & overlapping sets of steps. Specifically, Weimer et al. (6,532,657 B1) teach the need to protect gas turbine components, such as turbine disks, rotating seals, stationary shrouds, etc., which are said to be particularly subject to corrosion & oxidation damage due to combination of heat and corrosive/oxidative effects of contaminants in the gas cooling (abstract; figure 2; col. 1, lines 4-35; col. 2, lines 21-29; col. 3, lines 50-col. 4, lines 15+), where the protective coating procedure is preferably taught to include oxidized coating, including elements such as Al, Cr, Si or mixtures thereof, with teachings of oxidative steps in air that include substrate heating from about 1200°F-1550°F (i.e. about 649-843°C) for at least two hours. Therefore, Weimer et al. (657) is support in the of the above contention that compressor, disk & seal element rotor components of turbine engines would also need protective coatings where the above discussed coatings with oxidized portions would have been expected to be effective for these particular components also, where it would've been further obvious to one of ordinary skill in the art that the particular components of gas turbine disks or turbine seal elements also benefit from analogous oxidation protection, and that the means of supplying this protection could have been effectively provided via techniques as described in the primary reference of Schaeffer et al.

Note that while Weimer et al. (657) was published within a year of the present filing date, it is to it different inventive entity with only overlapping inventors.

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When discussing their ion implantation process, Schaeffer et al. do not discuss the temperature under which implantation occurs, however as discussed above one of ordinary skill incompetence would have been expected to employ routine experimentation to determine the appropriate temperature in which to affect taught ion implantation procedures for specific metallic substrate components, where the majority of the process energy would have been expected by one of ordinary skill to have been supplied by the ion bombardment itself.

Schaeffer also does not discuss the operating temperature range (about 540-815°C = about 1004-1499°F) of their treated metallic superalloy components of gas turbine engines, however they do have general background description concerning it being "well known, the power and efficiency of gas turbine engines typically increases with increasing nominal operating temperature, but the ability of the turbine to operate at increasingly higher temperatures is limited by the ability of the turbine components... to withstand the heat, oxidation and corrosion effects of the impinging hot gas stream and still maintain sufficient mechanical strength. Thus, there exists a continuing need to find advanced material systems for use in components that will function satisfactorily in high performance gas turbines, which operate at higher temperatures and stresses" (col. 1, lines 15-26+), hence the teachings of Schaeffer et al. are clearly directed to creating rotor components with operating temperatures that would have been expected by one of ordinary skill in the art to be inclusive of those claimed.

7. The patents of Naik (4,919,773) or Bedell et al. (GB 2241961 A) or Manty et al. (4,433,005) remained relevant as teaching references, as discussed above in section 8 of the action mailed 5/8/2007, and remain optionally applicable or cumulative to references discuss herein, such as Schaeffer, with their teachings relating to the meanings of "a compressor"  $\equiv$  compressor component. As previously cited, see Naik (4,919,773; col. 1, lines 14-30 & col. 2, lines 41-45 teaching gas turbine engine compressor blades & gas turbine compressor components) or Bedell et al. (GB 2241961 A: abstract & page 1, lines 1-7, compressor blade for a gas turbine aero engine or gas turbine compressor or blades) or



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Manty et al. (4,433,005: col. 1, lines 50-51 & col. 2, lines 3-6 & 18-22, gas turbine compressor environments & gas turbine [titanium] compressor blades), where this references appear to demonstrate that the turbine engine or the turbine is itself a compressor, hence any components thereof such as a vane or a compressor blade, is a compressor component. Alternately, as these terms are so typically used interchangeably such that treating turbine vanes or the like would have suggested to one of ordinary skill in the art to treat turbine compressor blades, as they may be considered equivalently.

8. Claims 12-14 & 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schaeffer et al. (5,780,110), as applied to claims 1 & 4-9 above, and further in view of Weimer et al. (657)

Schaeffer et al. (110) differs from these claims by requiring the ion implantation to necessarily be performed before heating in an oxygen-containing atmosphere, where additionally some of the claims also are directed to a different temperature range for that heating, however Weimer et al. discussed above as an optional reference, explicitly teach that before the oxidation step is performed, a protective coating may be deposited (col. 2, lines 21-38), i.e. the surface composition is already established, where the elements of Al, Cr, Si, P, or mixtures thereof are particularly noted to be important for establishing the oxidizing protective coating, thus as Schaeffer et al. teach both a related oxidation procedure & supplying overlapping elements to the surface that oxidize faster, it would've been obvious to one of ordinary skill in the art that it would've been advantageous to perform the surface doping step, before the heating in oxygen-containing atmosphere step in order to enable these elements to perform their oxidizing function, as discussed in both references. Furthermore, it would've been obvious to one of ordinary skill in the art that given overlapping techniques, with overlapping materials to effect analogous protective coatings for analogous purposes, that the heating in oxidizing atmosphere parameters of Weimer et al. (col. 2, lines 38-46), would have been expected to be effective in the process of Schaeffer et al., especially if one is considering providing protective coatings for the particular components discussed in Weimer et al. (turbine disk or shroud seals) of nickel-based superalloy components, as the material is an option of the

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primary reference, and the substrates treated therein are broad enough to encompass specific examples of Weimer et al., thus providing expectations that the ion implantation option for surface doping as discussed in the primary reference would have been effective for supplying elements desired for protective surfaces to be thermally oxidize as discussed in Weimer et al., whether applied to the specific components discussed in Weimer et al., or to the more general turbine components or the specific turbine components discussed in Schaeffer et al. Further note that in Weimer et al., col. 6, lines 1-13 there is discussion of testing the treated pieces for corrosion at 1300°F, i.e. 704°C, hence suggesting the expected operating temperature for treated components to be in this vicinity, thus further supporting the above obviousness of intended use temperatures for components treated by this combination of references.

9. Claims 1, 4-14 & 16-20 rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (791), in view of Schaeffer et al., further considering Weimer et al., optionally for claims 1 & 4-11, as discussed above in sections 6 & 8.

In Zhao et al. (791), see the abstract, col. 2, lines 43-col. 3, lines 20+ & 47-55; col. 4, lines 3-67; col. 5, lines 7-60; claims & below discussion of teachings therein. Note effective filing date is before the filing date of the present case, and this patent is to the same assignee, but all different inventors.

Claims 1 & 4-11 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-29 U.S. Patent No. 6,964,791 B2 (Zhao et al.), in view of Schaeffer et al., optionally considering Weimer et al. as discussed above in sections 6 & 8.

Claims 12-14 & 16-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-29 U.S. Patent No. 6,964,791 B2 (Zhao et al.), in view of Schaeffer et al., in view of Weimer et al. as discussed above in sections 6 & 8.

While the patent claims include the option of the substrate being a nickel-based superalloy, with the pending claims directed to a component of a gas turbine engine, inclusive of the option of a turbine disk, the claim of disposing a coating layer that may contain aluminum, while it may be deposited by ion

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plasma deposition, does not necessitate that implantation occurs during such a process, thus the conflicting claims are not identical, however they are not patentably distinct from each other because the claims are overlapping scope, because ion plasma deposition techniques are inclusive of such techniques including ion mixing due to ion bombardment, thus ion implantation, especially in view of Schaeffer et al. who discusses surface doping techniques that include both ion implantation, plus alternative techniques of plating or sputtering which would read on the patent (791)'s ion plasma deposition techniques. The secondary references also supply teachings for the obviousness of particular oxidation techniques, for reasons as discussed above, and as the coding technique for the patent claims is intended to be used for like purposes unlike substrates for like results. Other dependent claim limitations are also presented in different orders, and the patent claims requiring coating steps that are neither required nor excluded by the present claims. The independent claims of the patent require specific metal superalloy substrate material, while the present claims are generic or required no specific composition for the component treated. On the other hand, the patent independent claims are generic as to the article that is to be used in a "high-temperature oxidative environment", with only dependent claims 11 & 12 directed to a component for a gas turbine assembly, or specifically a turbine airfoil, a turbine disk or combustor, respectively, while the instant independent claim 1 requires a turbine engine rotor component, with the dependent claim 2 directed to specific rotor components of a compressor or turbine disk or seal element.

The patent claims are directed to depositing to coating layers both of which must contain Al, and where the first layer must also contain Zr & may also include Hf, Y, Si &/or Ce, where the physical deposition technique of ion plasma deposition may be employed for both layers, and where the two layers may be reacted/process so as to effect an Al composition gradient the heating, that may be *in situ* during deposition. Above discussion concerning present claim language problems with respect to "implanting", "on the surface..." & "a depth up to...", whose location is also not specified, are also relevant here providing overlapping & obvious relationships with the patent claim language, for the ion

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implanting of Al, Cr, Y, Ce, Zr, Cr, Hf & Si ions of the ion plasma deposition limitations. Furthermore, the patent claims use of ion plasma deposition & in situ heat-treating during deposition is considered to read on ion implanting into the preceding layer in light of the specification, which discusses reacting by heat treating on col. 4, lines 42-col. 5, line 6, with *in situ* heating during deposition col. 4, lines 52-67, teaching diffusing the Al of the second layer into the first layer, in particular specifying that the *in situ* heating may be achieved by applying a bias voltage to the substrate during the ion plasma deposition of the second layer. While not explicitly discussed in the section of the patent, the examiner takes notice that the use of bias voltage in the ion plasma deposition with both create the heating effect due to ion bombardment & provide the Al ions of the plasma with the energy to both deposit on the surface and implant into the surface, thus creating some degree of ion implantation in order to the effect the taught diffusion, thus reading on & encompassing the ion implanting of aluminum in the present claims. Note above discussed arguments for the obviousness of claimed ranges of depth of implantation when considering depth with respect to current and currently deposited coating are also relevant here. While the patent claims do not have a particular claimed temperature range for the heat treating process, one of ordinary skill in the art would determine such via routine experimentation, where analogous to previous discussion above of heating due to ion bombardment/implantation, it is noted that the ion treatment provides alternative energy source, such that the absolute amount of heat required to provide the desired effect, in this case producing the aluminum gradient, would have been expected to be less than if merely heat input, particularly after deposition was involved. Again in light of the specification, it is noted that post-treatment heating alternative to provide the same gradient effects is taught on col. 4, lines 45-52 require about 700-1200°C, where the 700°C endpoint is noted to overlap with the claimed ion implantation temperature range, hence it would've been obvious to one of ordinary skill to consider these temperatures or lower for effecting the claimed & taught in situ heat treatment during ion plasma

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deposition, such that considering the non-heat energy component of the bombarding ions would have been expected to make effective the lower temperature ranges as claimed presently by applicants.

10. Other art previously cited to the same assignee/overlapping inventors included Darolia (6,273,678 B1: col. 7, lines 60-col. 8, lines 18) or 7,087,266 B2: abstract; figures; col. 5, lines 1-9; col. 10, lines 1-8 & claims), which have teachings substantially similar/analogous to Rigney et al. (714) or Darolia et al.((049) or(480)), except they are a bit more general; and Zhao et al. (6,720,088 B2) & Darolia et al. (6,436,473 B2) which are directed to protective coatings for relevant and garments & articles, but lacked teachings of techniques with appropriate use of ions.

Other previously cited art of interest relevant to the invention included: Fujishiro et al. (4,137,370) & Eylon et al. (5,879,760), which along with Manty et al. ((005) mentioned above) discussing various surface treating techniques involving ion implantation &/or ion plating for providing fatigue &/or oxidation resistant coatings to relevant substrates, but while some of the treatments involve Al &/or Cr, they do not appear to be necessarily ion implanting, although there is background discussion (Manty et al., col. 1, lines 35-51, or also found in Bedell et al.(GB): p.1, line 25-p.2, line 3) concerning ion implantation with metals (i.e. Ce, Y, Al, etc.) of Ti substrates to protect against/inhibit thermal oxidation, but its effectiveness in gas turbine compressor environments was not discussed. Beers et al. (5,580,669) is of interest for oxidative resistant coatings for Ti alloys, such as used in **gas turbine engine compressor blades, vanes & related hardware**, where depositions employing ion vapor deposition or cathodic arc deposition of Cu alloys inclusive of Al &/or Si constituents are disclosed, for making components useful in claimed temperature ranges, but lacks disclosure concerning whether or not any ion implantation occurs. Paderov et al. (6,797,335 B1), who is also effecting treatments for high resistance to wear & corrosion with sufficient fatigue strength, primarily for **gas turbine compressor blades & vanes**, employs ion implantation with their deposition techniques, however uses nonmetallic ions. Lankford Jr. (4,775,548) has teachings for ion implantation processes of metal ions (i.e. Y, Zr, Zn,



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Ag, Nb, Ti, etc.), followed by oxidation in air at 600-800°C in ceramic compositions for low friction, high wear resistance at high operating temperatures in "adiabatic diesel engines" (appear to use pistons not rotors), and White (3,857,682) teaches a surface treatment of seal & bearing surfaces for use in high temperature environments, with mention of jet turbine heat engines & components of materials, such as steel, Al or Ti, with exemplary Al bodies ion plated with Cr, thus White provides cumulative evidence of the importance of treating seal surfaces.

11. Applicant's arguments filed 8/8/2007 and discussed above have been fully considered but they are not persuasive.

It is further noted with respect to Darolia et al. (6,617,049 B2 or 6,632,480 B2) or Rigney et al. (6,620,525 B1), or Rigney et al. (6,283,714 B1), previously discussed in sections 14-15 of the action mailed 8/5/2007 that applicant's clarification of the claim language to require implantation of the ions provides a variation in scope, as these disclosures have deposition techniques equivalent to that discussed above for Zhao (791) that do not necessitate or explicitly teach ion implantation (but also do not exclude), hence the rejections would be redundant with respect thereto. Nor do they appear to be directed to applicants probably intended, but not presently necessitated, choice of turbine disks or seal elements, which is Al (791) is inclusive of. Also, while these references are directed to superalloy substrates of rotor components that may be considered to overlap with compressors, only Darolia et al. (480) appears to be specifically directed to nickel-based alloys.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH**



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shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

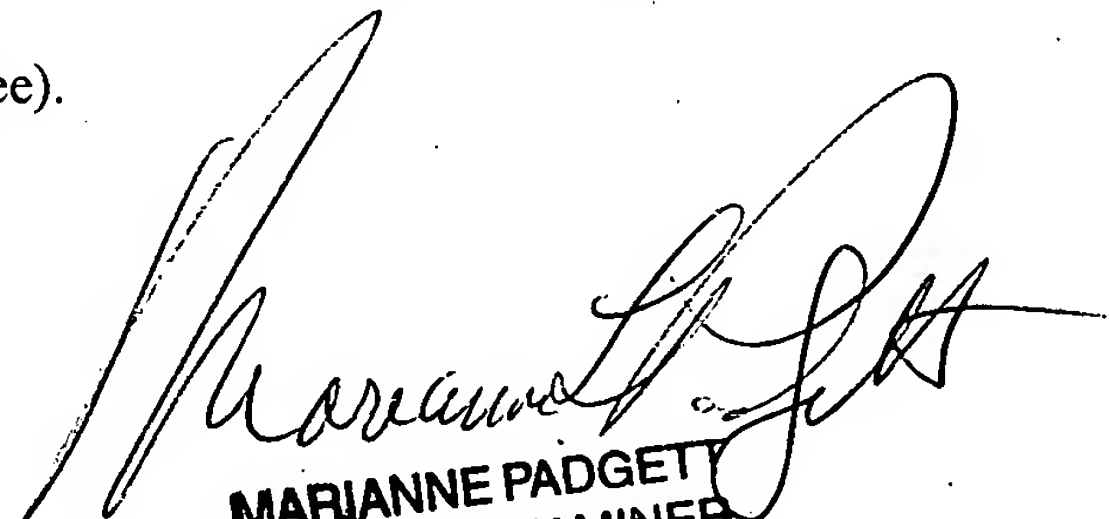
13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marianne L. Padgett whose telephone number is (571) 272-1425. The examiner can normally be reached on M-F from about 8:30 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MLP/dictation software

10/15/2007



MARIANNE PADGETT  
PRIMARY EXAMINER